REMARKS

Claims 3-14 and 16-32 are pending in the application and are presented for reconsideration. Claims 3, 16, 27, and 30 are the independent claims.

By the foregoing amendments, claims 3-10, 13, 16, 18-21, 24, 26, 27 and 30 are sought to be amended, claims 2 and 15 are cancelled without prejudice or disclaimer and some modifications are sought to be made to the specification and figures to address some of the issues identified by the Examiner and to provide additional clarity.

These changes are believed not to introduce new matter, and their entry is respectfully requested. The claims have been amended merely to clarify the claims and expedite the prosecution of the application.

Based on the above Amendment and the following Remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections, and withdraw them.

The Draftsperson has objected to some of the figures. Applicants request that the requirement for filing new drawings be held in abeyance until the application is allowed.

The Examiner objected to the IDS statement filed on January 8, 2001 for failing to identify the inventor and issue date. Our copy of the filed IDS does identify the inventor and issue date. However, we are submitting a new IDS that includes additional references for the Examiner's consideration.

The Examiner objected to the abstract. Applicants have amended the abstract in accordance with the PTO's requirements. The Examiner also objected to the disclosure for several additional reasons. Applicants have modified the specification and Figure 20 to alleviate these concerns. With respect to page 1, line 11 the application has been amended to refer to the issued patent. With respect to the term "RMS" at page 52, line 16, this refers to "Root Mean Square" as identified at page 37, line 19 that Applicants believe overcomes the Examiner's objection. Substitute Figure 20 has a reference to the system 2000 and the specification on page 62, line 23 has been amended to clarify how the diffuser 222 can be used in conjunction with Figure 20, although it is not illustrated in Figure 20.

Applicants believe that the objections to the specification have been accommodated or overcome and respectfully request that the Examiner reconsider and withdraw the objections.

Rejections under 35 U.S.C. §112

The Examiner has rejected claim 4 as allegedly not specifically pointing out and distinctly claiming the subject matter which the Applicants regard as his invention. Claim 4 has been amended and Applicants believe that this rejection has been overcome. Accordingly,

Applicants request that the rejection of claim 4 under section 112 be reconsidered and withdrawn.

The Examiner has rejected claims 2-4, 8-9, 15-17 and 26 under the obviousness provisions of 35 U.S.C. §103 as allegedly being unpatentable over U.S. Patent No. 5,644,562 to de Groot (hereafter referred to as "de Groot").

Independent claims 3 and 16 recite:

3. A method for measuring a first phase difference between first and second reflected polarized light signal components, the method comprising the steps of:
transmitting a first light signal toward a first object, wherein said first object is one of a magnetic disk and a silicon wafer;
separating the first reflected polarized light signal component and the second reflected polarized light signal component from said first light signal reflected off said first object;
detecting a first intensity of the first reflected polarized light signal component; and
detecting a second intensity of the second reflected polarized light signal component; and
determining a difference in phase between said first and second reflected polarized light signal components based upon said first and second intensities.

16. A system for measuring a first phase difference between first and second reflected polarized light signal components, comprising:
a light source for transmitting a first light signal toward a first object wherein said first object is one of a magnetic disk and a silicon wafer;
a polarization splitter for separating the first reflected polarized light signal component and the second reflected polarized light signal component from a reflected first light signal that is reflected off of said first object;
a first detector for detecting a first intensity of the first reflected polarized light signal component;
a second detector for detecting a second intensity of the second reflected polarized light signal component; and
a phase determinator for determining a difference in phase between the first and second reflected polarized light signal components based upon said first and second intensities.

Applicants note that the scope of claims 3 and 16 have not changed by this amendment since the amendment merely incorporates the previously independent claims 2 and 15. Based on the above Amendment and the following Remarks, Applicants respectfully request that the Examiner reconsider the rejection, and withdraw it.

The Examiner rejects 3 in view of de Groot and official notice taken by the examiner. Applicants believe that the de Groot reference is inconsistent with the present invention and therefore the taking of official notice will be moot. However, if the Examiner maintains the rejection of claims 3 and 16 then Applicants request that documentation supporting the official notice be provided.

The de Groot reference describes an optical flying height tester (OFHT) that can be used only if a glass disk is used instead of a magnetic hard drive. The de Groot reference admits that it cannot work by directly testing a magnetic hard drive. A goal of de Groot is to measure and compensate for the birefringence error created by a rotating glass disk. De Groot teaches a polarization technique that determines this birefringence error. This birefringence error does not exist when testing a magnetic hard drive directly. Instead it exists solely because de Groot requires the substitution of a hard drive with a glass disk to measure the flying height of the slider. De Groot admits that it is attempting to measure an interface between a magnetic disk and a slider but that it cannot measure the interface directly and instead it must substitute a glass disk for the magnetic disk. Only after removing the magnetic disk does de Groot attempt to measure the slider/glass disk interface. The de Groot reference addresses the problem of identifying the

birefringence error that is introduced by substituting a glass disk for a magnetic hard drive. De Groot does not and cannot measure the characteristics of a magnetic disk by it's own admission.

The de Groot reference admits that it does not work with a magnetic disk in a variety of locations. For example, beginning at column 1, line 51 de Groot admits that it is attempting to solve a problem where a glass disk is used instead of a magnetic disk, "One of the fundamental difficulties of prior art optical techniques is that the interface between the slider ABS and a real hard disk cannot be inspected directly. Most OFHT's therefore use a transparent surrogate disk, most commonly a glass disk, in place of a real magnetic hard disk." (emphasis added) de Groot continues by admitting that the use of glass adds an error that does not otherwise exist, i.e., birefringence. At column 2, line 23 de Groot admits that "A difficulty with polarization-based OFHT's is that they are sensitive to any polarization-dependent phenomena in the glass disk, including birefringence." De Groot then continues in it's summary of the invention at column 3, line 23 that de Groot "provides a method and apparatus for measuring and compensating for birefringence in rotating glass disks, such as are employed in polarization-based" OFTH's. The "disk" referred to in the remainder of the de Groot reference is a glass disk and cannot by its own admission be a magnetic hard disk or, similarly a silicon wafer.

In contrast, the present invention is a system and method for testing a magnetic disk and/or a silicon wafer. Since de Groot admits that it cannot operate with a magnetic disk, de Groot teaches away and is inconsistent with the claimed invention as applied to measuring a magnetic disk or a silicon wafer.

Since de Groot teaches away from the claimed invention it's teachings would lead one of ordinary skill in a direction divergent from the claimed invention. Accordingly, de Groot teaches away from the claimed invention and cannot be properly used as a reference rejecting the present claims since by teaching away it does not provide any teaching or suggestion to combine. In re Gurley, 31 USPQ 1130, 31 (Fed. Cir. 1994). *See also*, In re Fine, 5 USPQ2d 1596, 1598-99 (Fed. Cir. 1988). "[E]lements of separate prior patents [and/or publications] cannot be combined when there is no suggestion of such combination anywhere in those patents [and/or publications]...; and a court should avoid hindsight....Likewise, the teaching of [the cited references] are inconsistent with the claimed invention " (emphasis added; annotations within square brackets). Panduit Corp. v. Dennison Mfg. Co., 1 USPQ2d 1593, 1597 (Fed. Cir. 1987), citing ACS Hospital Systems, Inc. v. Montefiore Hospital, 220 USPQ 929, 933 (Fed. Cir. 1984).

In rejecting claims 4, 7, 8, 15, 16, 17 and 26 the Examiner refers to various equation in de Groot. As noted above, the disk referred to in de Groot is a glass disk and cannot be a magnetic disk.

The Examiner rejects claims 5-7 and 18-20 under the obviousness provisions of 35 U.S.C. §103 as allegedly being unpatentable over de Groot in view of U.S Patent No. 6,172,752 to Haruna et al. (hereafter "Haruna"). As described above, the de Groot reference is an improper reference because it teaches away from the claimed invention. The Examiner does not contend and Haruna in fact does not overcome the deficiencies in the rejection because of the improper use of the de Groot reference.

The Examiner rejects claims 10, 21, 27 and 30 under the obviousness provisions of 35 U.S.C. §103 as allegedly being unpatentable over de Groot in view of U.S Patent No. 5,610,897 to Yamamoto et al (hereafter "Yamamoto"). As described above, the de Groot reference is an improper reference because it teaches away from the claimed invention. The Examiner does not contend and Yamamoto in fact does not teach or suggest all of the claimed feature and therefore does not overcome the deficiencies in the rejection because of the improper use of the de Groot reference.

The Examiner rejects claims 11, 12, 22, 23, 28, 29, 31 and 32 under the obviousness provisions of 35 U.S.C. §103 as allegedly being unpatentable over de Groot in view of Yamamoto in view of U.S Patent No 5,985,680 to Singhal et al (hereafter Singhal). As described above, the de Groot reference is an improper reference because it teaches away from the claimed invention. The Examiner does not contend either Haruna or Singhal either alone or in combination teach or suggest all of the claimed features. In fact neither reference overcomes the deficiencies in the rejection because of the improper use of the de Groot reference.

The Examiner rejects claims 13, 14, 24, and 25 under the obviousness provisions of 35 U.S.C. §103 as allegedly being unpatentable over de Groot in view of Singhal. As described above, the de Groot reference is an improper reference because it teaches away from the claimed invention. The Examiner does not contend and Singhal in fact does not teach or suggest all of the claimed feature and therefore does not overcome the deficiencies in the rejection because of the improper use of the de Groot reference.

As indicated above, de Groot admits that it's teachings are inconsistent with the testing of a magnetic disk and that de Groot's invention solves a problem introduced by replacing a magnetic disk with a glass disk because de Groot states that magnetic disks cannot be tested directly (column 1, line 54). Since the de Groot reference is the primary reference for all of the rejections and the Examiner neither contends that the remaining references teach or suggest all of the claimed features, nor do the references in fact teach or suggest the claimed features, Applicants respectfully request that the Examiner reconsider and withdraw all objections and rejections.

Conclusion

Applicants believe that all of the stated grounds of objection and rejection set forth by the Examiner in the Office Action have been properly accommodated or addressed. Applicants, therefore, respectfully request that the Examiner reconsider all presently outstanding objections and rejections and withdraw them. The Examiner is invited to telephone the undersigned representative if it is felt that an interview might be useful for any reason.

Respectfully submitted
Meeks and Kudinar

Date: 29 April 2002

By: John T. McNelis

John T. McNelis
Attorney for Applicants
Reg. No. 37,186
FENWICK & WEST LLP
2 Palo Alto Square
Palo Alto, CA 94306
(650) 858-7133
jmcnelis@fenwick.com

Version with Markings to Show Changes Made

IN THE SPECIFICATION

Please amend the "Related Application" paragraph on page 1 as follows:

This application is a continuation-in-part of U.S. patent application serial number 09/136,897 filed on 19 August 1998 <u>now U.S. Patent No. 6,031,615</u> which claims priority from provisional application number 60/059,740 filed on 22 September 1997 which are both incorporated by reference herein in their entirety.

Please amend the paragraph beginning on page 61, line 9 as follows:

The system shown in Figure 20 operates in a manner similar to that shown in Figure 2. This system has a input aperture 2016 in the integrating sphere 218 which is slightly larger than the optical beam so that the beam is not eclipsed by the opening. The integrating sphere 218 has a hole 2022 in its bottom that allows the beam to strike the disk and reflect out of the integrating sphere through an aperture 2024. Aperture 2024 is slightly larger than the beam to allow the beam to pass through without being eclipsed. The location of aperture 2024 is less than 1 cm from the surface of the disk. The diameter of aperture 2024 can control the minimum spatial frequency of roughness, which the device can measure according to equation (3), discussed *supra*. The integrating sphere includes an opening at its top 2018 to allow scattered light to strike the scattered photodetector 224B. The specular beam is directed onto a collimating lens 220 which prevents the beam from spreading. After passing through the collimating lens it passes into a miniature integrating sphere 2028 through an opening 2030. The integrating sphere

reduces the sensitivity of the photodetector to disk distortion and runout. A distorted disk is one which differs from a perfect flat plane. The manufacturing process or the process of clamping the disk on the spindle can cause distortion of a disk. Disk runout is the motion of the disk in the vertical direction caused by imperfection in the spindle and mechanical vibrations of the disk. The specular intensity is detected via a hole 2032 in the miniature integrating sphere with a specular photodetector 224A. The hole 2030 is designed to be larger than the collimated specular beam so that the beam is not eclipsed by the beam. The integrating sphere 2028 is rotated slightly in the plane of the paper so that its entrance port is not perpendicular to the beam. This means that the reflected signal from the back of the integrating sphere 2028 will not retro-reflect down the optical path into the scattered light integrating sphere 218. Retro-reflect means to reflect substantially directly down the path of the incoming laser beam. The amount of reflected light which gets into the integrating sphere 218 is further reduced by using an opaque black baffle 2026 placed between the integrating sphere 218 and the collimating lens 220. Another means of reducing the sensitivity of the specular photodetector 224A to disk distortion is to place a diffuser (not shown) such as the diffuser 222 shown in Figure 2 in front of the specular photodetector 224A [as shown in Figure 2].

Please amend the paragraph beginning on page 77 line 4 as follows:

After passing through the non-polarizing beam splitter the other half of the beam is recollimated with a lens 220. It then passes through a mechanically rotatable quarter wave plate 2906 available from CVI Laser Corp. The beam is then polarization split with a Wollaston prism 2908 available from CVI Laser Corp., for example, and each polarization component is detected with a separate photodetector. The plane of the Wollaston prism (the plane of the S and P

components) is adjusted at 45 degrees to the plane of incidence. The [P] first mixed component of the beam (which includes both P and S components with respect to the plane of incidence) is directed to a conventional photodiode 2912 available from Hamamatsu Corp., for example, and the [S] second mixed component (which includes both P and S components with respect to the plane of incidence) is directed to a conventional photodiode 2910. The photodiodes have a diffuser 210 placed in front of them to reduce the residual position sensitivity of the photodiodes. The difference between the photodetectors is proportional to the cosine of the phase difference between the [S and P waves] first and second mixed components coming from the Wollaston prism. As a result this instrument can get different types of information when used in different modes.

Please amend the paragraph beginning on page 77, line 23 as follows:

When the polarization is adjusted to P, the P specular and P scattered light is measured resulting in sensitive measurements of carbon thickness and carbon wear. The P specular signal is obtained by rotating the half wave plate 2904 so that the incident polarization is P. The P specular signal is given by the sum of the signal from 2912 and 2910. When the polarization is adjusted to 45 degrees (exactly between P and S polarization) the instrument is most sensitive to measurements of the phase change induced by changes in the thickness of the thin films on the disk surface. In the phase shift mode the instrument measures lubricant thickness and carbon thickness on thin film disks. The phase shift is measured by taking the difference between the signals measured at 2912 and 2910. This gives an output that is proportional to the cosine of the phase difference between the [S and P] first and second mixed components of the wave. The orientation of the quarter wave plate 2906 is adjusted to optimize the sensitivity to lubricant and

carbon wear or thickness. The individual components may also be measured; that is, the [S and P] <u>first and second mixed</u> components of the 45 degrees polarized light. These are measured simultaneously with the phase shift and the scattered light.

Please amend the paragraph beginning on page 78, line 19 as follows:

The [S and the P] <u>first and second mixed</u> components of the 45 degree linearly polarized light are referred to as S_Q and P_Q. When these components of the phase shift are plotted in a two dimensional concentration histogram the interpretation of the data becomes as shown in Figure 31. Carbon wear is seen in the second quadrant, carbon thickness variation on the disk surface is the length of the body of the histogram, debris is in the third quadrant, and degraded lube and lube pooling is in the fourth quadrant.

IN THE ABSTRACT

As per 37 CFR 121 the following is a copy of the above amended Abstract with the changes from the previously pending application indicated.

ABSTRACT OF THE DISCLOSURE

A system and method for performing a magnetic imaging, optical profiling, and measuring lubricant thickness and degradation, carbon wear, carbon thickness, and surface roughness of thin film magnetic disks at angles that are not substantially Brewster's angle of the thin film [(carbon)] protective overcoat. [A focused optical light whose polarization can be switched between P or S polarization is incident at an angle to the surface of the thin film magnetic disk. This present invention allows the easy measurement of the change in lubricant thickness due to the interaction of the thin film head, the absolute lubricant thickness and degradation of the lubricant. It also allows the measurement of changes in carbon thickness and the absolute carbon thickness. The surface roughness can also be measured at any of the angles specified above. The rotation of the reflected polarized light can be measured to identify the Kerr-effect, and accordingly, the magnetic property of the point at which the light reflects from the disk. In addition, the present invention can mark the position of an identified defect (for example) by automatically positioning a scribe in close proximity to the target position, e.g., the position of the defect, and marking the disk with the scribe.]

IN THE CLAIMS

As per 37 CFR 121 the following is a copy of the above amended claims with the changes from the previously pending application indicated.

2. (Cancelled)

3. (Amended) A method for measuring a first phase difference between first and second reflected polarized light signal components, the method comprising the steps of:

transmitting a first light signal toward a first object, [The method of claim 2,] wherein said first object is one of a magnetic disk and a silicon wafer;

separating the first reflected polarized light signal component and the second reflected polarized light signal component from said first light signal reflected off said first object;

detecting a first intensity of the first reflected polarized light signal component; and

detecting a second intensity of the second reflected polarized light signal component; and determining a difference in phase between said first and second reflected polarized light signal components based upon said first and second intensities.

4. (Amended) The method of claim 3 [2, wherein the step of determining a difference includes] further comprising the step of:

determining a texture on said first object based upon said difference in phase. [difference between said first and second intensities to reduce the effects of a texture on said first object.]

5. (Amended) The method of claim [2] 3, further comprising the step of:

determining a thickness of a lubricant on said first object based upon said difference in phase.

6. (Amended) The method of claim [2] 3, further comprising the step of:

determining a thickness of a carbon layer of said first object based upon said difference in phase.

7. (Amended) The method of claim [2] 3, further comprising the step of:

determining a magnetic characteristic of said first object based upon said difference in phase.

8. (Amended) The method of claim [2] 3, further comprising the step of:

polarizing said first light signal to generate a first polarized light signal component and a second polarized light signal component of said first light signal, said first and second polarized light signal components being orthogonally polarized.

9. (Amended) The method of claim [2] 3, wherein the first and second reflected polarized light signal components are orthogonally polarized.

10. (Amended) The method of claim [2] 3, further comprising the step of:

measuring the magneto-optic Kerr effect based upon said difference in phase.

11. (Not Amended) The method of claim 10, further comprising the steps of:

determining a defect exists at a first location on the first object based upon said first and second intensities; and

marking said first location to identify said defect.

12. (Not Amended) The method of claim 11, wherein said marking step further comprises the steps of:

moving a mechanical scribe to a position substantially adjacent to said first location;

positioning said mechanical scribe at substantially said first location; and

marking said first location with said mechanical scribe.

13. (Amended) The method of claim [2] 3, further comprising the steps of:

determining a defect exists at a first location on the first object based upon said first and second intensities; and

marking said first location to identify said defect.

14. (Not Amended) The method of claim 13, wherein said marking step further comprises the steps of:

moving a mechanical scribe to a position substantially adjacent to said first location;

positioning said mechanical scribe at substantially said first location; and

marking said first location with said mechanical scribe.

15. (Cancelled)

16. (Amended) A system for measuring a first phase difference between first and second reflected polarized light signal components, comprising:

a light source for transmitting a first light signal toward a first object [The system of claim 15,] wherein said first object is one of a magnetic disk and a silicon wafer;

a polarization splitter for separating the first reflected polarized light signal component and the second reflected polarized light signal component from a reflected first light signal that is reflected off of said first object;

a first detector for detecting a first intensity of the first reflected polarized light signal component;

a second detector for detecting a second intensity of the second reflected polarized light signal component; and

a phase determinator for determining a difference in phase between the first and second reflected polarized light signal components based upon said first and second intensities.

17. (Not Amended) The system of claim 16, wherein said phase determinator comprises:

a texture eliminator for determining a difference between said first and second intensities to reduce the effects of a texture on said first object.

18. (Amended) The system of claim [15] 16, further comprising:

a thickness determinator for determining a thickness of a lubricant on said first object based upon said difference in phase.

19. (Amended) The system of claim [15] <u>16</u>, further comprising:

a carbon thickness determinator for determining a thickness of a carbon layer of said first object based upon said difference in phase.

20. (Amended) The system of claim [15] <u>16</u>, further comprising:

magnetic identifier for determining a magnetic characteristic of said first object based upon said difference in phase.

21. (Amended) The system of claim [15] <u>16</u>, further comprising:

Kerr effect determinator for measuring the magneto-optic Kerr effect based upon said difference in phase.

22. (Not Amended) The system of claim 21, further comprising:

defect determinator for determining a defect exists at a first location on the first object based upon said first and second intensities; and

a mechanical scribe for marking said first location to identify said defect.

23. (Not Amended) The system of claim 22, further comprising:

a scribe positioner for moving a mechanical scribe to a position substantially adjacent to said first location before marking said first location.

24. (Amended) The system of claim [15] <u>16</u>, further comprising:

defect determinator for determining a defect exists at a first location on the first object based upon said first and second intensities; and

a mechanical scribe for marking said first location to identify said defect.

25. (Not Amended) The system of claim 24, further comprising:

a scribe positioner for moving a mechanical scribe to a position substantially adjacent to said first location before marking said first location.

26. (Amended) The system of claim [15] 16, further comprising:

a polarizer for polarizing said first light signal to generate a first polarized light signal component and a second polarized light signal component of said first light signal, said first and second polarized light signal components being orthogonally polarized.

27. (Amended) A method for measuring a first phase difference between first and second reflected polarized light signal components, the method comprising the steps of:

transmitting a first light signal toward a first object, wherein said first object is one of a magnetic disk and a silicon wafer;

separating the first reflected polarized light signal component and the second reflected polarized light signal component from said first light signal reflected off said first object;

detecting a first intensity of the first reflected polarized light signal component;

detecting a second intensity of the second reflected polarized light signal component; and

measuring the magneto-optic Kerr effect based upon a difference in said first and second intensities.

28. (Not Amended) The method of claim 27, further comprising the steps of:

determining a defect exists at a first location on the first object based upon said first and second intensities; and

marking said first location to identify said defect.

29. (Not Amended) The method of claim 28, wherein said marking step further comprises the steps of:

moving a mechanical scribe to a position substantially adjacent to said first location;

positioning said mechanical scribe at substantially said first location; and

marking said first location with said mechanical scribe.

30. (Amended) A system for measuring a first phase difference between first and second reflected polarized light signal components, comprising:

a light source for transmitting a first light signal toward a first object, wherein said first object is one of a magnetic disk and a silicon wafer;

a polarization splitter for separating the first reflected polarized light signal component and the second reflected polarized light signal component from a reflected first light signal that is reflected off of said first object;

a first detector for detecting a first intensity of the first reflected polarized light signal component;

a second detector for detecting a second intensity of the second reflected polarized light signal component; and

Kerr effect determinator for measuring the magneto-optic Kerr effect based upon a difference in said first and second intensities.

31. (Not Amended) The system of claim 30, further comprising:

defect determinator for determining a defect exists at a first location on the first object based upon said first and second intensities; and

a mechanical scribe for marking said first location to identify said defect.

32. (Not Amended) The system of claim 31, further comprising:

a scribe positioner for moving a mechanical scribe to a position substantially adjacent to said first location before marking said first location.